

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

1 1. (Currently amended) A method of selecting a heuristic class for data placement in
2 a distributed storage system comprising the steps of:

3 forming an integer program for each of a plurality of heuristic classes,
4 each of the heuristic classes providing a technique for placing data within the
5 distributed storage system, each of the integer programs comprising an
6 objective of minimizing a replication cost for placing the data;

7 solving each of the integer programs which provide the replication cost for
8 each of the heuristic classes; and

9 selecting the heuristic class having a low replication cost.

1 2. (Currently amended) A method of selecting a heuristic class for data placement in
2 a distributed storage system comprising the steps of:

3 forming a general integer program which models placing data within the
4 distributed storage system; the data placement;

5 forming a specific integer program which models a heuristic class for the
6 data placement, that provides a technique for placing the data within the
7 distributed storage system, the general and specific integer programs each
8 comprising an objective of minimizing a replication cost for placing the data;

9 solving the general integer program which provides a general lower bound
10 for the replication cost;

11 solving the specific integer program which provides a specific lower
12 bound for the replication cost; and

13 selecting the heuristic class if a difference between the general lower
14 bound and the specific lower bound is within an allowable amount.

1 3. (Original) The method of claim 2 wherein inputs used in the steps of forming the
2 general and specific integer programs comprise a system configuration, a workload,

3 and a performance requirement.

1 4. (Original) The method of claim 3 wherein the performance requirement comprises
2 a bi-modal performance metric.

1 5. (Original) The method of claim 4 wherein the bi-modal performance metric
2 comprises a criterion and a ratio of successful attempts to total attempts.

1 6. (Original) The method of claim 3 wherein the performance requirement comprises
2 a data access latency.

1 7. (Original) The method of claim 3 wherein the performance requirement comprises
2 a data access bandwidth.

1 8. (Original) The method of claim 3 wherein the performance requirement comprises
2 a data update time.

1 9. (Original) The method of claim 3 wherein the performance requirement comprises
2 an average data access latency.

1 10. (Original) The method of claim 3 wherein the performance requirement comprises
2 a data availability requirement.

1 11. (Original) The method of claim 3 wherein the general integer program comprises
2 general constraints which model the data placement irrespective of the heuristic class
3 for the data placement.

1 12. (Original) The method of claim 11 wherein the general constraints comprise a
2 performance constraint which models the performance requirement.

1 13. (Original) The method of claim 11 wherein the specific integer program

2 comprises the general constraints and a specific constraint.

1 14. (Original) The method of claim 12 wherein the specific constraint comprises a
2 storage constraint.

1 15. (Original) The method of claim 12 wherein the specific constraint comprises a
2 replica constraint.

1 16. (Original) The method of claim 12 wherein the specific constraint comprises a
2 routing knowledge constraint and further wherein the routing knowledge constraint
3 models an extent to which a data storage node knows of replicas of data objects
4 stored on other data storage nodes.

1 17. (Original) The method of claim 12 wherein the specific constraint comprises an
2 access knowledge constraint and further wherein the access knowledge constraint
3 models an extent to which a data storage knows of access to replicas of data objects
4 by clients accessing other data storage nodes.

1 18. (Original) The method of claim 12 wherein the specific constraint comprises an
2 activity history constraint.

1 19. (Original) The method of claim 12 wherein the specific constraint comprises a
2 reactive placement constraint.

1 20. (Original) The method of claim 3 wherein the system configuration comprises a
2 plurality of data storage nodes coupled by a plurality of network links.

1 21. (Original) The method of claim 20 wherein the system configuration further
2 comprises a plurality of clients coupled to the data storage nodes.

1 22. (Original) The method of claim 21 wherein the workload comprises at least some

2 of the clients requesting data objects stored on the data storage nodes.

1 23. (Original) The method of claim 22 wherein the workload further comprises at
2 least some of the clients storing some of the data objects on the data storage nodes.

1 24. (Currently amended) A method of selecting a heuristic class for data placement
2 in a distributed storage system comprising the steps of:

3 forming a general integer program which models placing data within the
4 distributed storage system; the data placement;

5 forming a plurality of specific integer programs which model a plurality of
6 heuristic classes, each of the heuristic classes providing a technique for
7 placing the data within the distributed storage system, the general and specific
8 integer programs each comprising an objective of minimizing a replication
9 cost for placing the data;

10 solving the general integer program which provides a lower bound for the
11 replication cost;

12 solving the specific integer programs which provides the replication cost
13 for each of the heuristic classes; and

14 selecting a particular heuristic class correlated to a low replication cost if a
15 difference between the lower bound and the low replication cost is within an
16 allowable amount.

1 25. (Currently amended) A computer readable memory comprising computer code for
2 implementing a method of selecting a heuristic class for data placement in a
3 distributed storage system, the method of selecting the heuristic class comprising the
4 steps of:

5 forming an integer program for each of a plurality of heuristic classes,
6 each of the heuristic classes providing a technique for placing the data within
7 the distributed storage system, each of the integer programs comprising an
8 objective of minimizing a replication cost for placing the data;

9 solving each of the integer programs which provide the replication cost for

10 each of the heuristic classes; and
11 selecting the heuristic class having a low replication cost.

1 26. (Currently amended) A computer readable memory comprising computer code for
2 implementing a method of selecting a heuristic class for data placement in a
3 distributed storage system, the method of selecting the heuristic class comprising the
4 steps of:

5 forming a general integer program which models placing data within the
6 distributed storage system; the data placement;

7 forming a specific integer program which models a heuristic class for the
8 data placement, that provides a technique for placing the data within the
9 distributed storage system, the general and specific integer programs each
10 comprising an objective of minimizing a replication cost for placing the data;

11 solving the general integer program which provides a general lower bound
12 for the replication cost;

13 solving the specific integer program which provides a specific lower
14 bound for the replication cost; and

15 selecting the heuristic class if a difference between the general lower
16 bound and the specific lower bound is within an allowable amount.

1 27. (Currently amended) A computer readable memory comprising computer code for
2 implementing a method of selecting a heuristic class for data placement in a
3 distributed storage system, the method of selecting the heuristic class comprising the
4 steps of:

5 forming a general integer program which models placing the data within
6 the distributed storage system; the data placement;

7 forming a plurality of specific integer programs which model a plurality of
8 heuristic classes, each of the heuristic classes providing a technique for
9 placing the data within the distributed storage system, the general and specific
10 integer programs each comprising an objective of minimizing a replication
11 cost for placing the data;

12 solving the general integer program which provides a lower bound for the
13 replication cost;

14 solving the specific integer programs which provides the replication cost
15 for each of the heuristic classes; and

16 selecting a particular heuristic class correlated to a low replication cost if a
17 difference between the lower bound and the low replication cost is within an
18 allowable amount.